Special Colloquium

DR. ANTONIO PALACIOS
SAN DIEGO STATE UNIVERSITY

"CONNECTING PURE AND APPLIED MATHEMATICS WITH SCIENCE, ENGINEERING AND EDUCATION"

The advent of novel engineered or smart materials, whose properties can be significantly altered in a controlled fashion by external stimuli, has stimulated the design and fabrication of smaller, faster, and more energy-efficient devices. As the need for even more powerful technologies grows, networks have become popular alternatives to advance the fundamental limits of performance of individual devices. Thus, in the first part of this talk we provide an overview of fifteen years of research work aimed at combining analytical and computational group theoretical methods with equivariant bifurcation theory to model, analyze and fabricate novel network technologies such as: ultra-sensitive magnetic and electric field sensors; networks of nano-oscillators; and multi-frequency converters. In the second part of the talk, we discuss more recent work on networks with Hamiltonian nodes, motivated by vibratory gyroscopes systems. We use representation theory to find suitable bases to study and prove the existence and stability of patterns of oscillations that emerge via symmetry-breaking bifurcations.

Through a normal form analysis we investigate the effects of various coupling topologies and show that spatial symmetry alone is not enough to preserve the Hamiltonian structure of the network. The Hamiltonian approach can, in principle, be readily extended to other systems with symmetry and related technologies, e.g., energy harvesting. These works have been funded by NSF, ARO, DoE, DoD SPAWAR Command, ONR and NSA, and have led to multiple patents.

Wednesday, February 25th, 2015

Room 284, the 2nd Floor of the Surge Building

Tea Time: 3:30 - 3:40 p.m.

Vision Talk: 3:40 - 4:00 p.m.

Questions / Break: 4:00 - 4:10 p.m.

Scientific Talk: 4:10 - 5:00 p.m.

900 University Avenue Surge Building 2nd Floor Riverside, CA 92521 951-827-3113

Department of Mathematics